CLAIMS

1. An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said OSU and said W-MULDEM unit is established by extending a current-use optical fiber and a redundant optical fiber and access sections between said W-MULDEM unit and said individual ONUs are established by the extension of optical fibers, whereby downstream optical signals from said OSU to said ONUs and upstream optical signals from said ONUs to said OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said multiplexing section, and whereby said W-MULDEM unit performs wavelength multiplexing or wavelength demultiplexing for said upstream or downstream optical signals to provide bidirectional transmission, characterized in that:

the OSU includes

transmission means for multiplexing downstream optical signals having wavelengths $\lambda d1$ to λdn that correspond to said ONUs and that are to be transmitted to said ONUs along said current-use optical fiber, for multiplexing downstream optical signals having wavelengths $\lambda d1+\Delta\lambda$ to $\lambda dn+\Delta\lambda$ that correspond to said ONUs and that are to be transmitted to said ONUs along said redundant

optical fiber, and for selecting either said current-use optical fiber or said redundant optical fiber for use for transmission, and

reception means for receiving upstream optical signals having wavelengths λu1 to λun along said current-use optical fiber or for receiving upstream optical signals having wavelengths λu1+Δλ to λun+Δλ along said redundant optical fiber;

the individual ONUs receive corresponding downstream optical signals having wavelengths λd1 to λdn or corresponding downstream optical signals having wavelengths λd1+Δλ to λdn+Δλ, which are received along said optical fibers extended across said access sections, the individual ONUs transmit, to said optical fibers extended across said access sections, corresponding upstream optical signals that have wavelengths λu1 to λun and are to be transmitted along said current-use optical fiber extended across said multiplexing section, or corresponding upstream optical signals that have wavelengths λu1+Δλto λun+Δλ and are to be transmitted along said redundant optical fiber;

the W-MULDEM unit includes an array waveguide diffraction grating (AWG) having two ports, which are to be respectively connected to said current-use optical fiber and said redundant optical fiber, and n ports, which are to be connected to optical fibers corresponding to said ONUs;

the W-MULDEM unit demultiplexes to said ports corresponding to said ONUs said downstream optical signals that have wavelengths $\lambda d1$ to λdn and are received along said current-use optical fiber, or said downstream optical signals that have wavelengths $\lambda d1+\Delta\lambda$ to $\lambda dn+\Delta\lambda$ and are received along said redundant optical fiber, or multiplexes, to said port corresponding to said current-use optical fiber or said redundant optical fiber, said upstream optical signals that have wavelengths $\lambda u1$ to λun or wavelengths $\lambda u1+\Delta\lambda$ to $\lambda un+\Delta\lambda$ and that are received along said optical fibers corresponding to said ONUs; and

a wavelength difference between said downstream optical signal and said upstream optical signal corresponding to each of said ONUs is integer times a free spectrum range (FSR) of said AWG.

2. An optical wavelength division multiplexing access system according to claim 1, characterized in that said transmission means includes:

switching means for changing from a current-use optical fiber to a redundant optical fiber;

a supervisory light source for outputting current-use fiber supervisory light and reserve fiber supervisory light having wavelengths $\lambda s0$ and $\lambda s1$ that differ from the wavelengths of said upstream optical signals and said downstream optical signals;

a supervisory control unit, for detecting said

supervisory light having wavelengths $\lambda s0$ and $\lambda s1$ that is received along said current-use optical fiber and said redundant optical fiber, and outputting a selection signal to said switching means to change from said current-use optical fiber to said redundant optical fiber;

a multiplexing unit, for multiplexing said current-use fiber supervisory light having wavelength $\lambda s0$ and an optical signal transmitted along said current-use optical fiber;

a demultiplexing unit, for demultiplexing said current-use fiber supervisory light having wavelength $\lambda s0$ from an optical signal transmitted along said current-use optical fiber;

a multiplexing unit, for multiplexing said reserve fiber supervisory light having wavelength $\lambda s1$ and an optical signal transmitted along said redundant optical fiber; and

a demultiplexing unit, for demultiplexing said reserve fiber supervisory light having wavelength $\lambda s1$ from an optical signal transmitted along said redundant optical fiber.

3. An optical wavelength division multiplexing access system according to claim 1, characterized by:

when $\lambda d1$, $\lambda d2$, . . . and λdn are defined as wavelengths of downstream optical signals that are transferred along said current-optical fiber and correspond to said ONUs, and when a wavelength interval is a constant, defining

$\lambda d1+k$, $\lambda d2+k$, . . . and $\lambda dn+k$ (k is an integer of one or greater to smaller than n) as wavelengths of downstream optical signals that are transferred along said redundant optical fiber to said ONUs, and

when $\lambda u1$, $\lambda u2$, . . . and λun are defined as wavelengths of upstream optical signals that are transferred along said current-optical fiber and correspond to said ONUs, and when a wavelength interval is a constant, defining $\lambda u1+k$, $\lambda u2+k$, . . . and $\lambda un+k$ (k is an integer of one or greater) as wavelengths of upstream optical signals that are transferred along said redundant optical fiber to said ONUs.

4. An optical wavelength division multiplexing access system according to claim 3, characterized by:

replacing $\lambda dn + i$ with λdi when $\lambda dn + i = \lambda di + FSR$ is established; and

replacing $\lambda un + i$ with λui when $\lambda un + i = \lambda ui + FSR$ is established (i is an integer of 1 to k).

5. An optical wavelength division multiplexing access system according to claim 1, characterized in that said OSU includes:

switching means for changing from said upstream (or downstream) current-use optical fiber to said upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for collectively detecting

a transmission cutoff of upstream signals from said ONUs, and for transmitting a selection signal to said switching means.

6. An optical wavelength division multiplexing access system according to claim 1, characterized in that said OSU includes:

switching means for changing from said upstream (or downstream) current-use optical fiber to said upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for individually detecting a transmission cutoff of upstream signals from said ONUs, and for transmitting a selection signal to said switching means.

7. An optical wavelength division multiplexing access system according to claim 1, characterized in that said OSU includes:

means for individually detecting a transmission cutoff of downstream signals.

8. An optical wavelength division multiplexing access system according to claim 2, characterized in that, under a condition wherein current-use optical receivers and current-use optical receivers are in the normal state, when said current-use fiber supervisory light having wavelength $\lambda s0$ is not detected and said reserve fiber

supervisory light having wavelength $\lambda s1$ is detected, or when said current-use fiber supervisory light having wavelength $\lambda s0$ is not detected and said reserve fiber supervisory light having wavelength $\lambda s1$ is also not detected, and when said upstream optical receivers of said OSU do not receive upstream optical signals, said supervisory control unit transmits a selection signal to perform communication using said redundant optical fiber.

9. An optical wavelength division multiplexing access system according to claim 5, characterized in that, when a transmission cutoff of all upstream optical signals is detected by said means that collectively detects a transmission cutoff of upstream optical signals from said ONUs, said supervisory control unit performs a process for transmitting a selection signal to perform communication using said redundant optical fiber.

10. An optical wavelength division multiplexing access system according to claim 6, characterized in that, when a transmission cutoff of all upstream optical signals is detected by said means that individually detects a transmission cutoff of upstream optical signals from said ONUs, said supervisory control unit performs a process for transmitting a selection signal to perform communication using said redundant optical fiber.

11. An optical wavelength division multiplexing access system according to claim 1, characterized in that, when a transmission cutoff of a plurality of upstream optical signals is detected by said means that individually detects a transmission cutoff of upstream optical signals from said ONUs, said supervisory control unit performs a process for transmitting a selection signal to perform communication using said redundant optical fiber.

12. An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged through a W-MULDEM unit, whereby a multiplexing section between said OSU and said W-MULDEM unit is established by extending a current-use downstream optical fiber, a current-use upstream optical fiber, a reserve downstream optical fiber and a reserve upstream optical fiber and access sections between said W-MULDEM unit and said individual ONUs are established by the extension of downstream optical fibers and of upstream optical fibers, whereby downstream optical signals from said OSU to said ONUs and upstream optical signals from said ONUs to said OSU are multiplexed, using wavelengths that are allocated to said individual ONUs, and resultant optical signals are transmitted across said multiplexing section, and whereby said W-MULDEM unit performs either wavelength multiplexing or wavelength division for said upstream or downstream optical signals to provide

bidirectional transmission, characterized in that:

the OSU includes

transmission means for multiplexing downstream optical signals having wavelengths $\lambda d1$ to λdn that correspond to said ONUs and that are to be transmitted to said ONUs along said current-use downstream optical fiber, for multiplexing downstream optical signals having wavelengths $\lambda d1+\Delta\lambda$ to $\lambda dn+\Delta\lambda$ that correspond to said ONUs and that are to be transmitted to said ONUs along said reserve downstream optical fiber, and for selecting either said current-use downstream optical fiber or said reserve downstream optical fiber used for transmission, and

reception means for receiving upstream optical signals having wavelengths $\lambda u1$ to λun transmitted along said current-use upstream optical fiber, or for receiving upstream optical signals having wavelengths $\lambda u1+\Delta\lambda$ to $\lambda un+\Delta\lambda$ transmitted along said reserve upstream optical fiber;

the ONUs receive, along said optical fibers extended across said access sections, corresponding downstream optical signals having wavelengths $\lambda d1$ to λdn or corresponding downstream optical signals having wavelengths $\lambda d1+\Delta\lambda$ to $\lambda dn+\Delta\lambda$, the ONUs transmit, to said optical fibers extended across said access sections, corresponding upstream optical signals that have wavelengths $\lambda u1$ to λun and that are to be transmitted along said current-use optical fiber extended across said

multiplexing section, or corresponding upstream optical signals that have wavelengths $\lambda u1+\Delta\lambda$to $\lambda un+\Delta\lambda$ and are to be transmitted along said redundant optical fiber;

the W-MULDEM unit includes

a downstream array waveguide diffraction grating (AWG) having two ports, which are to be respectively connected to said current-use downstream optical fiber and said reserve downstream optical fiber, and n ports, which are to be connected to optical fibers corresponding to said ONUs, and

an upstream array waveguide diffraction grating (upstream AWG) having two ports, which are to be respectively connected to said current-use upstream optical fiber and said reserve upstream optical fiber, and n ports, which are connected to said optical fibers corresponding to said ONUs; and

the W-MULDEM unit demultiplexes to said ports of said downstream AWG that correspond to said ONUs said downstream optical signals that have wavelengths $\lambda d1$ to λdn and are received along said current-use downstream optical fiber, or said downstream optical signals that have wavelengths $\lambda d1+\Delta\lambda$ to $\lambda dn+\Delta\lambda$ and are received along said reserve downstream optical fiber, or multiplexes, to said port corresponding to said current-use upstream optical fiber or said reserve upstream optical fiber, said upstream optical signals that have wavelengths $\lambda u1$ to λun or wavelengths $\lambda u1+\Delta\lambda$ to $\lambda un+\Delta\lambda$ and that are transmitted to

said upstream AWG along said optical fibers corresponding to said ONUs.

13. An optical wavelength division multiplexing access system according to claim 12, characterized in that: said transmission means includes

switching means for changing from said upstream (or downstream) current-use optical fiber to said upstream (or downstream) redundant optical fiber,

a supervisory light source for outputting a current-use fiber supervisory light and a reserve fiber supervisory light having wavelengths λs0 and λs1 that differ from wavelengths of said upstream optical signals and said downstream optical signals,

a supervisory control unit, for detecting said supervisory lights having wavelengths λs0 and λs1 that are received along said upstream current-use fiber and said upstream reserve fiber, and for outputting a selection signal to said switching means to change from said upstream (or downstream) current-use fiber to said upstream (or downstream) reserve fiber,

a multiplexing unit, for multiplexing said current-use fiber supervisory light having wavelength λs0 and an optical signal transmitted along said downstream (or upstream) current-use optical fiber,

a demultiplexing unit, for demultiplexing said current-use fiber supervisory light having wavelength λs0

from an optical signal transmitted along said upstream (or downstream) current-use optical fiber,

a multiplexing unit, for multiplexing said reserve fiber supervisory light having wavelength $\lambda s1$ and an optical signal transmitted along said downstream (or upstream) redundant optical fiber, and

a demultiplexing unit, for demultiplexing said reserve fiber supervisory light having wavelength $\lambda s1$ from an optical signal transmitted along said upstream (or downstream) redundant optical fiber; and

said W-MULDEM unit includes

a demultiplexing unit, for demultiplexing said current-use optical fiber supervisory light having wavelength $\lambda s0$, which has been multiplexed with said optical signal and has been received along said downstream (or upstream) current-use optical fiber,

a multiplexing unit, for re-multiplexing said current-use optical fiber supervisory light having wavelength $\lambda s0$ and an optical signal transmitted along said upstream (or downstream) current-use optical fiber,

a demultiplexing unit, for demultiplexing said redundant optical fiber supervisory light having wavelength $\lambda s1$ that has been multiplexed with an optical signal and received along said downstream (or upstream) redundant optical fiber, and

a multiplexing unit, for re-multiplexing said redundant optical fiber supervisory light having wavelength

$\lambda s1$ and an optical signal transmitted along said upstream (or downstream) optical fiber.

14. An optical wavelength division multiplexing access system according to claim 12, characterized by:

when $\lambda d1$, $\lambda d2$, . . . and λdn are defined as wavelengths of downstream optical signals that are transferred along said current-optical fiber and correspond to said ONUs, and when a wavelength interval is a constant, defining $\lambda d1+k$, $\lambda d2+k$, . . . and $\lambda dn+k$ (k is an integer of one or greater to smaller than n) as wavelengths of downstream optical signals that are transferred along said redundant optical fiber to said ONUs, and

when $\lambda u1$, $\lambda u2$, . . . and λun are defined as wavelengths of upstream optical signals that are transferred along said current-optical fiber and correspond to said ONUs, and when a wavelength interval is a constant, defining $\lambda u1+k$, $\lambda u2+k$, . . . and $\lambda un+k$ (k is an integer of one or greater) as wavelengths of upstream optical signals that are transferred along said redundant optical fiber to said ONUs.

15. An optical wavelength division multiplexing access system according to claim 14, characterized by:

replacing $\lambda dn + i$ with λdi when $\lambda dn + i = \lambda di + FSR$ is established; and

replacing $\lambda un + i$ with λui when $\lambda un + i = \lambda ui + FSR$

is established (i is an integer of 1 to k).

16. An optical wavelength division multiplexing access system according to claim 12, characterized in that said OSU includes:

switching means for changing from said upstream (or downstream) current-use optical fiber to said upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for collectively detecting a transmission cutoff of upstream signals from said ONUs, and for transmitting a selection signal to said switching means.

17. An optical wavelength division multiplexing access system according to claim 12, characterized in that said OSU includes:

switching means for changing from said upstream (or downstream) current-use optical fiber to said upstream (or downstream) redundant optical fiber; and

a supervisory control unit, for individually detecting a transmission cutoff of upstream signals from said ONUs, and for transmitting a selection signal to said switching means.

18. An optical wavelength division multiplexing access system according to claim 12, characterized in that said OSU includes:

means for individually detecting a transmission cutoff of downstream signals.

19. An optical wavelength division multiplexing access system according to claim 13, characterized in that, under a condition wherein current-use optical receivers and current-use optical receivers are in the normal state, when said current-use fiber supervisory light having wavelength $\lambda s0$ is not detected and said reserve fiber supervisory light having wavelength $\lambda s1$ is detected, or when said current-use fiber supervisory light having wavelength $\lambda s0$ is not detected and said reserve fiber supervisory light having wavelength $\lambda s1$ is also not detected, and when said upstream optical receivers of said OSC do not receive upstream optical signals, said supervisory control unit transmits a selection signal to perform communication using said redundant optical fiber.

20. An optical wavelength division multiplexing access system according to claim 16, characterized in that, when a transmission cutoff of all upstream optical signals is detected by said means that collectively detects a transmission cutoff of upstream optical signals from said ONUs, said supervisory control unit performs a process for transmitting a selection signal to perform communication using said redundant optical fiber.

21. An optical wavelength division multiplexing access system according to claim 17, characterized in that, when a transmission cutoff of all upstream optical signals is detected by said means that individually detects a transmission cutoff of upstream optical signals from said ONUs, said supervisory control unit performs a process for transmitting a selection signal to perform communication using said redundant optical fiber.

22. An optical wavelength division multiplexing access system according to claim 17, characterized in that, when a transmission cutoff of a plurality of upstream optical signals is detected by said means that individually detects a transmission cutoff of upstream optical signals from said ONUs, said supervisory control unit performs a process for transmitting a selection signal to perform communication using said redundant optical fiber.

23. An optical wavelength division multiplexing access system according to claim 12, characterized in that wavelengths of downstream current-use optical signals that correspond to said ONUs are equalized with wavelengths of upstream current-use optical signals, and wavelengths of downstream reserve optical signals are equalized with wavelengths of upstream reserve optical signals.

24. An optical wavelength division multiplexing

access system according to claim 12, characterized in that: said OSU includes

means for oscillating optical carriers having wavelengths $\lambda u1$ to λun, which are used for upstream signals, so as to permit said ONUs to generate upstream optical signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream current-use optical fiber, and

means for oscillating optical carriers having wavelengths $\lambda u1+\Delta\lambda u$ to $\lambda un+\Delta\lambda u$, which are used for upstream signals, so as to permit said ONUs to generate upstream optical signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream redundant optical fiber;

said ONUs include

means for modulating corresponding optical carriers, used for upstream signals, from among those that are received while multiplexed with downstream optical signals, and transmitting thereby obtained signals as upstream optical signals having wavelengths $\lambda u1$ to λun, or wavelengths $\lambda u1+\Delta\lambda u$ to $\lambda un+\Delta\lambda u$;

a wavelength difference between said downstream optical signals and said upstream optical signals corresponding to said ONUs is defined as integer times a free spectrum range (FRS) of said downstream AWG; and

said downstream AWG provided for said W-MULDEM unit is so constituted as to separate, at the same time, said

downstream optical signals and said optical carriers, used for upstream signals, which correspond to said ONUs.

25. An optical wavelength division multiplexing access system according to claim 12, characterized in that:
said OSU includes

means for oscillating optical carriers having wavelengths λu1 to λun, which are used for upstream signals, so as to permit said ONUs to generate upstream optical signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream current-use optical fiber, and

means for oscillating optical carriers having wavelengths λu1+Δλu to λun+Δλu, which are used for upstream signals, so as to permit said ONUs to generate upstream optical signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream redundant optical fiber;

said W-MULDEM unit includes, in addition to said downstream AWG and said upstream AWG,

two wavelength group demultiplex filters, for demultiplexing downstream optical signals having wavelengths λd1 to λdn, which are received along said downstream current-use optical fiber from said optical carriers having wavelengths λu1 to λun that are used for upstream signals, and for demultiplexing said downstream optical signals having wavelengths λd1+Δλd to λdn+Δλd,

which are received, along said downstream redundant optical fiber, from said optical carriers having wavelengths $\lambda u1+\Delta\lambda u$ to $\lambda un+\Delta\lambda u$ that are used for upstream signals,

an upstream signal optical carrier AWG, for routing said optical carriers having wavelengths $\lambda u1$ to λun, used for upstream signals, to ports corresponding to said ONUs, and

n wavelength group coupling filters, for multiplexing said downstream optical signals that are sorted by said downstream AWG and said optical carriers, used for upstream signals, that are sorted by said upstream signal optical carrier AWG, and transmitting the resultant signals to said downstream optical fibers that correspond to said ONUs;

said ONUs are so constituted as to modulate corresponding optical carriers, used for upstream signals, from among those that are received while multiplexed with said downstream optical signals, and to transmit the obtained signals as upstream optical signals having wavelengths $\lambda u1$ to λun, or wavelengths $\lambda u1+\Delta\lambda u$ to $\lambda un+\Delta\lambda u$.

26. An optical wavelength division multiplexing access system according to claim 25, characterized by:

when $\lambda d1$, $\lambda d2$, . . . and λdn are defined as wavelengths of downstream optical signals that are transferred along said current-optical fiber and correspond to said ONUs, and when a wavelength interval is a constant, defining

$\lambda d1+k$, $\lambda d2+k$, . . . and $\lambda dn+k$ (k is an integer of one or greater to smaller than n) as wavelengths of downstream optical signals that are transferred along said redundant optical fiber to said ONUs, and

when $\lambda u1$, $\lambda u2$, . . . and λun are defined as wavelengths of upstream optical signals that are transferred along said current-optical fiber and correspond to said ONUs, and when a wavelength interval is a constant, defining $\lambda u1+k$, $\lambda u2+k$, . . . and $\lambda un+k$ (k is an integer of one or greater) as wavelengths of upstream optical signals that are transferred along said redundant optical fiber to said ONUs.

27. An optical wavelength division multiplexing access system according to claim 26, characterized by:

replacing $\lambda dn + i$ with λdi when $\lambda dn + i = \lambda di + FSR$ is established; and

replacing $\lambda un + i$ with λui when $\lambda un + i = \lambda ui + FSR$ is established (i is an integer of 1 to k).

28. An optical wavelength division multiplexing access system according to claim 26, characterized in that said means for oscillating said optical carriers, having wavelengths $\lambda u1$ to λun, that are used for upstream signals, and said means for oscillating said optical carriers, having wavelengths $\lambda u1+k$ to $\lambda un+k$, that are used for upstream signals, are constituted by one means for oscillating

optical carriers having wavelengths $\lambda u1$ to $\lambda un+k$; and said optical carriers having wavelengths $\lambda u1$ to $\lambda un+1$, used for upstream signals, are transmitted to said downstream current-use optical fiber and said downstream redundant optical fiber.

29. An optical wavelength division multiplexing access system according to claim 13, characterized in that: said transmission means includes

n current-use optical transmitters and n reserve optical transmitters, for transmitting downstream optical signals having wavelengths $\lambda dw1$ to λdwn and downstream optical signals having wavelengths $\lambda dp1$ to λdpn,

a downstream current-use wavelength multiplexing unit, having n ports to be connected to said n current-use optical transmitters and one port to be connected to said downstream current-use optical fiber, and

a downstream reserve wavelength multiplexing unit, having n ports to be connected to said n reserve optical transmitters and one port to be connected to said downstream optical fiber;

said downstream optical signals having wavelengths $\lambda dw1$ to λdwn, which are received from said n current-use optical transmitters and are multiplexed by said downstream current-use wavelength multiplexing unit, and a resultant signal is output to said downstream current-use optical fiber;

said downstream optical signals having wavelengths λdp1 to λdpn, which are received from said n reserve optical transmitters, are multiplexed by said downstream reserve wavelength multiplexing unit, and a resultant signal is output to said downstream redundant optical fiber; and

said current-use and reserve optical transmitters include means for selecting the presence/absence of an optical output in accordance with a selection signal received from said supervisory control unit.

30. An optical wavelength division multiplexing access system according to claim 13, characterized in that: said transmission means includes

n current-use optical transmitters and n reserve optical transmitters, for transmitting downstream optical signals having wavelengths λdw1 to λdwn and downstream optical signals having wavelengths λdp1 to λdpn,

n downstream current-use optical switches, for setting ON or OFF for the output of received optical signals,

a downstream current-use multiplexing unit, having n ports to be connected to said n downstream current-use optical switches and one port to be connected to said downstream current-use optical fiber,

n downstream reserve optical switches, for setting ON or OFF for the input of received optical switches, and

a downstream reserve multiplexing unit, having

n ports to be connected to said n downstream reserve optical switches and one port to be connected to said downstream redundant optical fiber;

said downstream optical signals transmitted by said current-use optical transmitters and said reserve optical transmitters are received by said optical switches, and outputs of said optical switches are selected in accordance with a selection signal transmitted by said supervisory control unit;

said downstream optical signals having wavelengths $\lambda dw1$ to λdwn, output by said n current-use optical switches, are multiplexed by said downstream current-use multiplexing unit and a resultant signal is output to said downstream current-use optical fiber;

said downstream optical signals having wavelengths $\lambda dp1$ to λdpn, output by said n reserve optical switches, are multiplexed by said downstream reserve multiplexing unit and a resultant signal is output to said downstream current-use optical fiber; and

when said downstream current-use optical fiber is employed for transmission of downstream optical signals to said ONUs, said downstream optical signals having wavelengths $\lambda dw1$ to λdwn, corresponding to said ONUs, are multiplexed, and when said downstream redundant optical fiber is employed for transmission, said downstream optical signals having wavelengths $\lambda dp1$ to λdpn, corresponding to said ONUs, are multiplexed, so that the transmission

is performed by selecting either said downstream current-use optical fiber, or said downstream redundant optical fiber.

31. An optical wavelength division multiplexing access system according to claim 13, characterized in that: said transmission means includes

n current-use optical transmitters for, upon receiving downstream electric signals, transmitting downstream optical signals having wavelengths λdw1 to λdwn, and n reserve optical transmitters, for, upon receiving downstream electric signals, transmitting downstream optical signals having wavelengths λdp1 to λdpn,

a downstream current-use multiplexing unit, having n ports to be connected to said n current-use optical transmitters and one port to be connected to a downstream current-use optical switch,

a downstream reserve multiplexing unit, having n ports to be connected to said n reserve optical transmitters and one port to be connected to a downstream reserve optical switch,

one downstream current-use optical switch, for setting ON/OFF for the output of a multiplexed downstream optical signal received from said downstream current-use multiplexing unit, and

one downstream current-use optical switch, for setting ON/OFF for the output of a multiplexed downstream

optical signal received from said downstream reserve multiplexing unit;

said downstream current-use optical signals having wavelengths λdp1 to λdwn, output by said n current-use optical transmitters, are multiplexed by said downstream current-use multiplexing unit and a resultant signal is output to said downstream current-use optical switch;

said downstream reserve optical signals having wavelengths λdp1 to λdpn, output by said n reserve optical transmitters, are multiplexed by said downstream reserve multiplexing unit and a resultant signal is output to said downstream reserve optical switch; and

either a current-use optical fiber or a redundant optical fiber to be used for output is selected in accordance with a selection signal transmitted by said supervisory control unit.

32. An optical wavelength division multiplexing access system according to claim 13, characterized in that:

a wavelength λdpk (k = 1 to n) is set as λdwk + Δλd (k = 1 to n; Δλd is a constant value);

said transmission means includes

n current-use optical transmitters and n reserve optical transmitters for, upon receiving downstream electric signals, outputting downstream optical signals having wavelengths λdw1 to λdwn and downstream optical signals having wavelengths λdp1 to λdpn,

n optical switches, used to select said current-use optical transmitters that transmit a downstream optical signal having wavelength λdwk (k is an integer of one or greater to n or smaller), or said reserve optical transmitters that transmit a downstream optical signal having wavelength λdpk (k is an integer of one or greater to n or smaller), and

a downstream array waveguide diffraction grating (downstream AWG), having n ports to be connected to said n optical switches and two ports to be connected to said downstream current-use optical fiber and said redundant optical fiber; and

said downstream optical signals having wavelength λdwk and wavelength λdpk are transmitted from said current-use optical transmitters to said optical switches, either said downstream optical signal having wavelength λdwk or wavelength λdpk is selected and output by said n optical switches to said downstream AWG, and in accordance with said downstream optical signal having said selected wavelength, said downstream current-use optical fiber or said downstream redundant optical fiber is employed to multiplex and output the resultant signal.

33. An optical wavelength division multiplexing access system according to claim 13, characterized in that: a wavelength λdpk (k = 1 to n) is set as λdwk + ΔλD (k = 1 to n; Δλd is a constant value);

said transmission means includes

n current-use optical transmitters for selecting and transmitting downstream signals having either wavelength λdwk (k is an integer of one or greater to n or smaller) or wavelength λdpk (k is an integer of one or greater or n or smaller), and

a downstream array waveguide diffraction grating (downstream AWG), having n ports to be connected to said n optical transmitters and two ports to be connected to said downstream current-use optical fiber and said redundant optical fiber;

said downstream optical signals having wavelength λdwk (k is an integer of one or greater to n or smaller) or wavelength λdpk (k is an integer of one or greater to n or smaller) are selected in accordance with a selection signal received from said supervisory control unit and are output by said optical transmitters; and

said downstream AWG multiplexes and outputs an obtained signal along said downstream optical fiber or said downstream redundant optical fiber that is consonant with said downstream optical signals having said selected wavelength.

34. An optical wavelength division multiplexing access system according to claim 13, characterized in that: said transmission means includes

n current-use optical receivers, for converting

received upstream optical signals having wavelengths λuw1 to λuwn into upstream electric signals and outputting said upstream electric signals, and n reserve optical receivers, for converting received upstream optical signals having wavelengths λup1 to λupn into upstream electric signals and for outputting said upstream electric signals,

an upstream current-use demultiplexing unit, having n ports to be connected to said n current-use optical receivers and one port to be connected to said upstream current-use optical fiber, and

an upstream reserve demultiplexing unit, having n ports to be connected to said n reserve optical receivers and one port to be connected to said upstream reserve fiber;

said upstream optical signals received along said upstream current-use optical fiber are divided by said upstream current-use demultiplexing unit and transmitted to said current-use optical receivers;

said upstream optical signals received along said upstream redundant optical fiber are divided by said upstream demultiplexing unit and transmitted to said reserve optical receivers; and

upstream electric signals to be output are selected in accordance with a selection signal transmitted by said supervisory control unit.

35. An optical wavelength division multiplexing access system according to claim 13, characterized in that:

said transmission means includes

n current-use optical receivers, for converting received upstream optical signals having wavelengths $\lambda uw1$ to λuwn into upstream electric signals and outputting said upstream electric signals, and n reserve optical receivers, for converting received upstream optical signals having wavelengths $\lambda up1$ to λupn into upstream electric signals and for outputting said upstream electric signals,

an upstream current-use demultiplexing unit, having n ports to be connected to said n current-use optical receivers and one port to be connected to said upstream current-use optical fiber,

an upstream reserve demultiplexing unit, having n ports to be connected to said n reserve optical receivers and one port to be connected to said upstream reserve fiber,

one upstream current-use optical switch, used to set ON/OFF for the output, to said upstream current-use demultiplexing unit, of upstream optical signals received from said upstream current-use demultiplexing unit, and

one upstream reserve optical switch, used to set ON/OFF for the output, to said upstream reserve demultiplexing unit, of upstream optical signals received from said upstream reserve demultiplexing unit;

when said upstream current-use optical switch and said upstream reserve optical switch are set to ON or OFF in accordance with a selection signal received from said supervisory control unit, either a multiplexed upstream

optical signal, transmitted along said upstream current-use optical fiber, or a multiplexed upstream signal, transmitted along said upstream redundant optical fiber, is selected and is output to said upstream current-use demultiplexing unit or said upstream reserve demultiplexing unit, and signals obtained by said demultiplexing unit are transmitted to said current-use optical receivers or said reserve optical receivers.

36. An optical wavelength division multiplexing access system according to claim 13, characterized in that: said transmission means includes

n current-use optical receivers, for converting received upstream optical signals having wavelengths $\lambda uw1$ to λuwn into upstream electric signals and outputting said upstream electric signals, and n reserve optical receivers, for converting received upstream optical signals having wavelengths $\lambda up1$ to λupn into upstream electric signals and for outputting said upstream electric signals,

an upstream current-use demultiplexing unit, having n ports to be connected to said n current-use optical receivers and one port to be connected to said upstream current-use optical fiber,

an upstream reserve demultiplexing unit, having n ports to be connected to said n reserve optical receivers and one port to be connected to said upstream reserve fiber,

n upstream current-use optical switches, used

to set ON/OFF for the output, to said upstream current-use demultiplexing unit, of upstream optical signals received from said upstream current-use demultiplexing unit, and

n upstream current-use optical switches, used to set ON/OFF for the output, to said upstream current-use demultiplexing unit, of upstream optical signals received from said upstream current-use demultiplexing unit;

a multiplexed upstream optical signal transmitted to said upstream current-use demultiplexing unit along said upstream current-use fiber is demultiplexed and obtained signals are output to said upstream current-use optical switches;

a multiplexed upstream optical signal transmitted to said upstream reserve demultiplexing unit along said upstream reserve fiber is demultiplexed and obtained signals are output to said upstream reserve optical switches; and

when said upstream current-use optical switches or said upstream reserve optical switches are set to ON/OFF in accordance with a selection signal received from said supervisory control unit, said upstream current-use demultiplexing unit or said upstream reserve demultiplexing unit is selected and signals are transmitted to said current-use optical receivers or said reserve optical receivers.

37. An optical wavelength division multiplexing

access system according to claim 13, characterized in that: a wavelength λupk (k = 1 to n) is set as λuwk + Δλu (k = 1 to n; Δλu is a constant value);

said transmission means includes

optical transmitters for selecting and outputting upstream optical signals having either wavelength λuwk (k is an integer of one or greater to n or smaller) or wavelength λupk (k is an integer of one or greater or n or smaller),

n optical receivers, for converting, into electric signals, received upstream optical signals having either wavelengths λuw1 to λuwn, or wavelengths λup1 to λupn, and outputting said electric signals, and

an upstream array waveguide diffraction grating (upstream AWG), having two ports to be connected to said upstream current-use optical fiber and said redundant optical fiber and n ports to be connected to said n optical receivers;

said upstream optical signal having wavelength λuwk (k is an integer of one or greater to n or smaller) or wavelength λupk (k is an integer of one or greater to n or smaller), which has been selected in accordance with a selection signal received from said supervisory control unit, is transmitted to said W-MULDEM unit; and

said W-MULDEM unit outputs said upstream optical signal to said current-use optical fiber or said redundant optical fiber that is consonant with said wavelength, and said

upstream AWG demultiplexes said upstream optical signal and transmits the obtained signals to said optical receivers.

38. An optical wavelength division multiplexing access system according to claim 37, characterized in that: said OSU includes

means for oscillating optical carriers having wavelengths $\lambda uw1$ to λuwn, which are used for upstream signals, so as to permit said ONUs to generate upstream optical signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream current-use optical fiber, and

n optical transmitters, for selecting and outputting an upstream optical signal having wavelength λuwk (k is an integer of one or greater to n or smaller) or wavelength λupk (k is an integer of one or greater to n or smaller), and an upstream signal AWG, having two ports to be connected to said current-use optical fiber and said redundant optical fiber and n ports to be connected to said optical transmitters, both of said optical transmitters and said upstream signal AWG being provided as means, for oscillating optical carriers having wavelengths $\lambda up1$ to λupn, that are used for upstream signals, so as to permit said ONUs to generate upstream optical signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream

redundant optical fiber;

said upstream optical signal, which has wavelength λuwk (k is an integer of one or greater to n or smaller) or wavelength λupk (k is an integer of one or greater to n or smaller), is output by said upstream signal AWG to either said current-use optical fiber or said redundant optical fiber, which is consonant with a selection signal transmitted by said supervisory control unit, and is multiplexed with a downstream optical signal and the resultant signal is transmitted to said wavelength multiplexer.

39. An optical wavelength division multiplexing access system according to claim 38, characterized in that said optical transmitters add, to downstream signals, a selection signal transmitted by said supervisory control unit and transmit the obtained signals to said ONUs.

40. An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said OSU and said W-MULDEM unit is established by extending a downstream current-use optical fiber, an upstream current-use optical fiber, a downstream redundant optical fiber and an upstream redundant optical fiber, and access sections between said W-MULDEM unit and said individual ONUs are established

by the extension of downstream optical fibers and upstream optical fibers, whereby downstream optical signals from said OSU to said ONUs and upstream optical signals from said ONUs to said OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said multiplexing section, and whereby said W-MULDEM unit performs wavelength multiplexing or wavelength division for said upstream or downstream optical signals to provide bidirectional transmission, characterized in that:

the OSU includes

transmission means for multiplexing downstream optical signals having wavelengths λdw1 to λdwn that correspond to said ONUs and that are to be transmitted to said ONUs along said downstream current-use optical fiber, for multiplexing downstream optical signals having wavelengths λdp1 to λdpn that correspond to said ONUs and that are to be transmitted to said ONUs along said downstream redundant optical fiber, and for selecting either said downstream current-use optical fiber or said downstream redundant optical fiber for use for transmission, and

reception means for receiving upstream optical signals having wavelengths λuw1 to λuwn along said upstream current-use optical fiber or for receiving upstream optical signals having wavelengths λup1 to λupn along said upstream redundant optical fiber;

the individual ONUs receive corresponding downstream

optical signals having wavelengths λdw1 to λdwn or corresponding downstream optical signals having wavelengths λdp1 to λdpn, which are received along said optical fibers extended across said access sections, and transmit, to said optical fibers extended across said access sections, corresponding upstream optical signals that have wavelengths λuw1 to λuwn and are to be transmitted along said upstream current-use optical fiber extended across said multiplexing section, or corresponding upstream optical signals that have wavelengths λup1 to λupn and are to be transmitted along said upstream redundant optical fiber;

said W-MULDEM unit includes

a downstream current-use demultiplexing unit corresponding to said downstream current-use optical fiber, and a downstream reserve demultiplexing unit corresponding to said downstream redundant optical fiber,

n wavelength group coupling filters for multiplexing, for corresponding ports, downstream optical signals having wavelengths λdw1 to λdwn, which have been demultiplexed by said current-use demultiplexing unit, and downstream optical signals having wavelengths λdp1 to λdpn, which have been demultiplexed by said downstream reserve demultiplexing unit, and for outputting obtained signals to said downstream optical fibers that correspond to said ONUs,

an upstream current-use multiplexing unit

corresponding to said upstream current-use optical fiber and an upstream reserve multiplexing unit corresponding to said upstream redundant optical fiber, and

n wavelength group demultiplex filters, for dividing and transmitting, to corresponding ports of said upstream current-use multiplexing unit or said upstream reserve multiplexing unit, said upstream optical signals having wavelengths λuw1 to λuwn and having wavelengths λup1 to λupn, all of which are received from said upstream optical fibers corresponding to said ONUs;

said downstream optical signals having wavelengths λdw1 to λdwn, which are received along said downstream current-use optical fiber, or said downstream optical signals having wavelengths λdp1 to λdpn, which are received along said downstream redundant optical fiber, are divided into ports corresponding to said ONUs;

said upstream optical signals having wavelengths λuw1 to λuwn, or said upstream optical signals having wavelengths λup1 to λupn, which are received from said upstream optical fibers corresponding to said ONUs, are merged at said port that corresponds to said upstream current-use optical fiber or said upstream redundant optical fiber; and

different bands are provided for said wavelengths λdw1 to λdwn of said downstream current-use optical signals and said wavelengths λuw1 to λuwn of said downstream reserve optical signals, and different bands are provided for said wavelengths λuw1 to λuwn of said upstream current-use

optical signals and said wavelengths λup1 to λupn of said upstream reserve optical signals.

41. An optical wavelength division multiplexing access system according to claim 40, characterized in that wavelengths of downstream current-use optical signals that correspond to said ONUs are equalized with wavelengths of upstream reserve optical signals, and wavelengths of upstream current-use optical signals are equalized with wavelengths of downstream reserve optical signals.

42. An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said OSU and said W-MULDEM unit is established by extending a downstream current-use optical fiber, an upstream current-use optical fiber, a downstream redundant optical fiber and an upstream redundant optical fiber, and access sections between said W-MULDEM unit and said individual ONUs are established by the extension of downstream optical fibers and upstream optical fibers, whereby downstream optical signals from said OSU to said ONUs and upstream optical signals from said ONUs to said OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said multiplexing section, and whereby said W-MULDEM unit performs wavelength

multiplexing or wavelength division for said upstream or downstream optical signals to provide bidirectional transmission, characterized in that:

the OSU includes

transmission means for, when said ONUs are divided into two groups, #1 to #k and #k+1 to #n, and downstream optical signals are divided into two wavelength groups, $\lambda d1$ to λdk and $\lambda dk+1$ to λdn, multiplexing downstream optical signals having wavelengths $\lambda d1$ to λdk so as to transmit downstream optical signals to said ONUs #1 to #k along said downstream current-use optical fiber, for multiplexing downstream optical signals having wavelengths $\lambda dk+1$ to λdn for transmission along said downstream redundant optical fiber, for multiplexing downstream optical signals having wavelengths $\lambda dk+1$ to λdn so as to transmit downstream optical signals to said ONUs #k+1 to #n along said downstream current-use optical fiber, and for multiplexing downstream optical signals having wavelengths $\lambda d1$ to λdk for transmission along said downstream redundant optical fiber, so that either said downstream current-use optical fiber or said downstream redundant optical fiber is selected for transmission, and

reception means for, when upstream optical signals are divided into two wavelength groups, $\lambda u1$ to λuk and $\lambda uk+1$ to λun, receiving upstream optical signals, for which wavelengths $\lambda u1$ to λuk for current use and wavelengths $\lambda uk+1$ to λun for reserve use are allocated

for said ONUs #1 to #k, and for which wavelengths λuk+1 to λun for current use and wavelengths λu1 to λuk for reserve use are allocated for said ONUs #k+1 to #n;

said ONUs receive, along said downstream optical fibers at said access sections, downstream optical signals having corresponding wavelengths λd1 to λdk, or wavelengths λdk+1 to λdn, and transmit, to said upstream optical fibers, upstream optical signals having corresponding wavelengths λu1 to λuk when said upstream current-use optical fiber at said multiplexing section is employed for transmission, or transmit upstream optical signals having corresponding wavelengths λuk+1 to λun when said upstream redundant optical fiber is employed for transmission;

said W-MULDEM unit includes

two ports to be connected to said downstream current-use optical fiber and said downstream redundant optical fiber,

a downstream current-use demultiplexing unit corresponding to said downstream current-use optical fiber and a downstream reserve demultiplexing unit corresponding to said downstream redundant optical fiber,

n wavelength group coupling filters, for multiplexing, for said individual ports, said downstream optical signals having wavelengths λd1 to λdk and λdk+1 to λdn, which have been demultiplexed by said downstream current-use demultiplexing unit, and said downstream optical signals having wavelengths λdk+1 to λdn and λd1

to λdk, which have been demultiplexed by said downstream reserve demultiplexing unit, and for transmitting obtained signals to said upstream current-use optical fiber and said upstream redundant optical fiber,

two ports to be connected to said upstream current-use optical fiber and said upstream redundant optical fiber,

an upstream current-use multiplexing unit corresponding to said upstream current-use optical fiber and an upstream reserve multiplexing unit corresponding to said upstream redundant optical fiber, and

n wavelength group demultiplex filters, for dividing said upstream optical signals having wavelengths $\lambda u1$ to λuk and $\lambda uk+1$ to λun and wavelengths $\lambda uk+1$ to λun and $\lambda u1$ to λuk, which are received along said upstream optical fiber corresponding to said ONUs, and outputting the signals to said corresponding ports of said upstream current-use multiplexing unit or said upstream reserve multiplexing unit; and

said downstream optical signals having wavelengths $\lambda d1$ to λdn, which are received along said downstream current-use optical fiber or said downstream redundant optical fiber, are divided among said ports corresponding to said ONUs, and said upstream optical signals having wavelengths $\lambda u1$ to λun, which are received along said upstream optical fibers corresponding to said ONUs, are multiplexed at said port that corresponds to said upstream

current-use optical fiber or said redundant optical fiber.

43. An optical wavelength division multiplexing access system, whereby a center node (OSU) and n optical network units (ONUs) are arranged by using a W-MULDEM unit, whereby a multiplexing section between said OSU and said W-MULDEM unit is established by extending a downstream current-use optical fiber, an upstream current-use optical fiber, a downstream redundant optical fiber and an upstream redundant optical fiber, and access sections between said W-MULDEM unit and said individual ONUs are established by the extension of downstream optical fibers and upstream optical fibers, whereby downstream optical signals from said OSU to said ONUs and upstream optical signals from said ONUs to said OSU are multiplexed using wavelengths that are allocated to individual ONUs and the resultant signals are transmitted across said multiplexing section, and whereby said W-MULDEM unit performs wavelength multiplexing or wavelength division for said upstream or downstream optical signals to provide bidirectional transmission, characterized in that:

the OSU includes

transmission means for multiplexing downstream optical signals having wavelengths $\lambda dw1$ to λdwn that correspond to said ONUs and that are to be transmitted to said ONUs along said downstream current-use optical fiber,for multiplexing downstream optical signals having

wavelengths λdp1 to λdpn that correspond to said ONUs and that are to be transmitted to said ONUs along said downstream redundant optical fiber, and for selecting either said downstream current-use optical fiber or said downstream redundant optical fiber for use for transmission,

reception means for receiving upstream optical signals having wavelengths λuw1 to λuwn along said upstream current-use optical fiber or for receiving upstream optical signals having wavelengths λup1 to λupn along said upstream redundant optical fiber,

means for oscillating optical carriers, having wavelengths λuw1 to λuwn, which are used by said ONUs for generation of upstream signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream current-use optical fiber, and

means for oscillating optical carriers, having wavelengths λup1 to λupn, which are used by said ONUs for generation of upstream signals, and for multiplexing said optical carriers and transmitting a resultant carrier to said downstream redundant optical fiber;

the individual ONUs receive corresponding downstream optical signals having wavelengths λdw1 to λdwn or corresponding downstream optical signals having wavelengths λdp1 to λdpn, which are received along said optical fibers extended across said access sections, and transmit, to said optical fibers extended across said access sections, corresponding upstream optical signals that have

wavelengths $\lambda uw1$ to λuwn and are to be transmitted along said upstream current-use optical fiber extended across said multiplexing section, or corresponding upstream optical signals that have wavelengths $\lambda up1$ to λupn and are to be transmitted along said upstream redundant optical fiber;

said W-MULDEM unit includes

a downstream array waveguide diffraction grating (downstream AWG), having two ports to be connected to said downstream current-use optical fiber and said downstream redundant optical fiber and n ports to be connected to said downstream optical fibers corresponding to said ONUs,

an upstream array waveguide diffraction grating (upstream AWG), having two ports to be connected to said upstream current-use optical fiber and said upstream redundant optical fiber and n ports to be connected to said upstream optical fibers corresponding to said ONUs,

two wavelength group demultiplex filters, for demultiplexing optical carriers having wavelengths $\lambda uw1$ to λuwn, which are used for upstream signals, from downstream optical signals having wavelengths $\lambda dw1$ to λdwn, which are received along said downstream current-use optical fiber, and for demultiplexing optical carriers having wavelengths $\lambda up1$ to λupn, which are used for upstream signals, from downstream optical signals having wavelengths $\lambda dp1$ to λdpn, which are received along said downstream redundant optical fiber,

an upstream signal optical carrier AWG, for dividing said optical carriers, which have wavelengths λuw1 to λuwn and are used for upstream signals, among said ports corresponding to said ONUs, and

n wavelength group coupling filters, for multiplexing said downstream optical signals, which have been demultiplexed by said downstream AWG, and said optical carriers, used for upstream signals, which have been demultiplexed by said upstream signal optical carrier AWG, and for transmitting the resultant signals to said downstream optical fibers corresponding to said ONUs;

said downstream optical signals having wavelengths λdw1 to λdwn, which are transmitted along said downstream current-use optical fiber to said downstream AWG, or said downstream optical signals having wavelengths λdp1 to λdpn, which are transmitted along said downstream redundant optical fiber, are divided among said ports corresponding to said ONUs; and

said upstream optical signals having wavelengths λuw1 to λuwn or wavelengths λup1 to λupn, which are transmitted to said upstream AWG along said upstream current-use optical fibers corresponding to said ONUs, are merged at said port corresponding to said upstream current-use optical fiber or said upstream redundant optical fiber.

44. An optical wavelength division multiplexing access system according to claim 43, characterized by:

providing, instead of said upstream signal optical carrier AWG, an upstream current-use signal optical carrier AWG corresponding to said downstream current-use optical fiber and an upstream reserve signal optical carrier AWG corresponding to said downstream redundant optical fiber, and n wavelength group coupling filters for multiplexing, for individual ports, said upstream signal optical carriers having wavelengths λuw1 to λdwu, which have been demultiplexed by said upstream current-use signal optical carrier AWG, and said upstream signal optical carriers having wavelengths λup1 to λupn, which have been demultiplexed by said upstream reserve signal optical carrier AWG;

providing, instead of said downstream AWG, a downstream current-use AWG corresponding to said downstream current-use optical fiber and a downstream reserve AWG corresponding to said downstream redundant optical fiber, and n wavelength group coupling filters, for multiplexing, for individual ports, said downstream optical signals having wavelengths λdw1 to λdwn, which have been demultiplexed by said downstream current-sue AWG, and said downstream optical signals having wavelengths λdp1 to λdpn, which have been demultiplexed by said downstream reserve AWG; and

providing, instead of said upstream AWG, an upstream current-use AWG corresponding to said upstream current-use optical fiber and an upstream reserve AWG corresponding

to said upstream redundant optical fiber, and n wavelength group demultiplex filters, for dividing said upstream optical signals having wavelengths $\lambda uw1$ to λuwn and wavelengths $\lambda up1$ to λupn, which are received along said upstream optical fibers corresponding to said ONUs, and for transmitting resultant signals to corresponding ports of said upstream current-use AWG or said reserve AWG.

45. An optical wavelength division multiplexing access system according to claim 43, characterized by:

dividing said ONUs into two groups, #1 to #k and #k+1 to #n;

when dividing downstream optical signals into two wavelength groups, $\lambda d1$ to λdk and $\lambda dk+1$ to λdn, allocating current-use wavelengths $\lambda d1$ to λdk and reserve wavelengths $\lambda dk+1$ to λdn for said ONUs #1 to #k, and allocating current-use wavelengths $\lambda dk+1$ to λdn and reserve wavelengths $\lambda d1$ to λdk for said ONUs #k+1 to #n;

when dividing upstream optical signals into two wavelength groups, $\lambda u1$ to λuk and $\lambda uk+1$ to λun, allocating current-use wavelengths $\lambda u1$ to λuk and reserve wavelengths $\lambda uk+1$ to λun for said ONUs #1 to #k, and allocating current-use wavelengths $\lambda uk+1$ to λun and reserve wavelengths $\lambda u1$ to λuk for said ONUs #k+1 to #n;

providing, instead of said upstream signal optical carrier AWG, an upstream current-use signal optical carrier demultiplexing unit that corresponds to said downstream

current-use optical fiber and an upstream reserve signal optical carrier demultiplexing unit that corresponds to said downstream redundant optical fiber, and n wavelength group coupling filters, for multiplexing, for individual ports, upstream signal optical carriers having wavelengths λu1 to λuk and λuk+1 to λun, which have been demultiplexed by said upstream current-use signal optical carrier demultiplexing unit, and upstream signal optical carriers having wavelengths λuk+1 to λun and λu1 to λuk, which have been demultiplexed by said upstream reserve signal optical carrier demultiplexing unit;

providing, instead of said downstream AWG, a downstream current-use demultiplexing unit that corresponds to said downstream current-use optical fiber and a downstream reserve demultiplexing unit that corresponds to said downstream redundant optical fiber, and n wavelength group coupling filters for multiplexing, for individual ports, downstream optical signals having wavelengths λd1 to λdk and λdk+1 to λdn, which have been demultiplexed by said downstream current-use demultiplexing unit, and downstream optical signals having wavelengths λdk+1 to λdn and λd1 to λdk, which have been demultiplexed by said downstream reserve demultiplexing unit; and

providing, instead of said upstream AWG, an upstream current-use multiplexing unit that corresponds to said upstream current-use optical fiber and an upstream reserve multiplexing unit that corresponds to said upstream

redundant optical fiber, and n wavelength group demultiplex filters, for demultiplexing upstream optical signals having wavelengths λu1 to λuk and λuk+1 to λun and wavelengths λuk+1 to λun and λu1 to λuk, which are received along said upstream optical fibers corresponding to said ONUs, and for transmitting resultant signals to corresponding ports of said upstream current-use multiplexing unit or said upstream reserve multiplexing unit.

46. An optical wavelength division multiplexing access system according to one of claims 1 to 45, characterized by:

allocating, for an arbitrary ONU, two wavelengths or more for a downstream current-use optical signal, a downstream reserve optical signal, an upstream current-use optical signal and an upstream reserve optical signal, so as to obtain a dual structure for optical fibers at said access sections.